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Measuring How Stress Impacts Physical Activity Behaviors in Undergraduates

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Measuring How Stress Impacts Physical Activity Behaviors in Undergraduates

by

Katelyn Ann Born, B.S.

Thesis

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Science in Kinesiology

The University of Texas at Austin

August 2015

Acknowledgements

I would first and foremost like to express my deep gratitude for my adviser, Dr. John Bartholomew, for mentoring me through this process and answering all of my many questions in full. I would also like to thank my lab director, Dr. Esbelle Jowers for agreeing to be a part of my committee and providing the support I needed. Lastly, I would like to show my gratitude to my lab members for all of their support both academically and psychologically. I am truly lucky to be surrounded by the best.

Abstract

Measuring How Stress Impacts Physical Activity Behaviors in Undergraduates

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The University of Texas at Austin, 2015

Supervisor: John Bartholomew

PURPOSE: To examine the effect of self-reported life stress on objective measures of physical activity. METHODS: Participants were a convenience sample of 98 undergraduates. Participants wore an ActiGraph GT1M Accelerometer for 6 consecutive days. Thirty participants were eliminated due to insufficient wear time (at least 8 hours/day). On each day of the week, they completed the Perceived Stress Scale. This was used to identify their highest and lowest stress day of the week excluding weekends. In addition, participants were divided according to their reports of consistent, exercise behavior. ANALYSIS: A 2 (gender) X 2 (day) RM-ANOVA was conducted to examine differences in time spent in MVPA. RESULTS: There was a significant interaction for gender, in that females increased their time spent in MVPA on their high stress day compared to their low stress day while males MVPA did not change, $F(1, 66) = 7.55$, $p = .008$. DISCUSSION: These results support findings by Lutz et al (2010), and extend it by using a sample with males and an objective measure of MVPA. Future studies should investigate the impact of exercise behavior on the relationship between stress and exercise.

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Thesis

INTRODUCTION

Stress, even acute forms, challenges an individual emotionally and physically. Chronic stress is particularly problematic as it can lead to physical and emotional exhaustion (McEwen, 2007). Some of the health implications of chronic stress include depression, immune system suppression, diabetes, and impaired wound healing (Aldwin & Yancura, 2010). Stress has also been linked with increased risk of chronic disease, especially cardiovascular disease (Krantz & McCeney, 2002). In fact, it is estimated that high levels of stress are associated with approximately a 50% increase in CVD risk (Kivimäki et al., 2006). Given this, it is concerning that 36% of Americans reported their stress has increased in the past year, and 42% reported that their stress has increased in the past 5 years (American Psychological Association [APA], 2013).

With these known health impacts, it is critical to find methods to cope with stress. One of the most effective is physical activity (Stults-Kolehmainen, 2013). Aerobic exercise has been shown to reduce perceived stress and blood pressure in both hypertensive and normotensive individuals (Crews & Landers, 1987; Whelton et al., 2002). High intensity aerobic exercise has been shown to reduce reactivity to subsequent stressors, or the extent to which your body reacts to a stressful event (Rejeski, 1992; Steptoe et al., 1993; Bartholomew, 2000; Brownley, 2003). The reduced stress reactivity was mostly likely due to physiological effects of post-exercise hypotension (Pescatello & Kulikowich, 2001). The previous studies did not find an effect beyond an hour and required a high intensity bout of exercise suggesting that frequent high intensity bouts of exercise are required in order to gain the benefit of exercise in reducing stress reactivity.

Unfortunately, there is evidence that people reduce their levels of physical activity under periods of stress. Lower levels of physical activity and exercise are seen in those who have higher levels of stress (Stults-Kolehmainen & Sinha, 2014). While this is may appear to be a highly intuitive finding, there is some evidence that people respond to stress with greater levels of physical activity and exercise. In the same literature review, approximately 17% of the studies found a positive association between the two (Stults-Kolehmainen & Sinha, 2014). This degree of variation suggests that there is a key moderating factor that has yet to be identified and the area should be investigated further.

One study that has investigated this was conducted by Lutz and colleagues (2010). They studied the exercise behavior and stress levels of 95 college-aged females over a 6 week period. Both exercise behavior and stress were self-reported. Results indicated that women who were regular exercisers increased their levels of physical activity and exercise with higher levels of stress while all other women decreased their levels of physical activity. There were, however, a number of limitations with this study. Men were not included so no comparisons could be made as a function of sex. This is important as it is well known that women are less active than men (Center for Disease Control and Prevention, 2014), and that they cope with stress differently (Nicholls, Polman, Levy, Taylor, & Cobley, 2007). In combination, these could lead to a difference in physical activity levels in response to stress. In addition, both history of exercise and present physical activity levels were self-reported in this study. Self-report is notoriously inaccurate for physical activity (Sallis & Saelens, 2000). In addition, stress can impact the report of health-related information (Rod, Grønbæk, Schnohr, Prescott, & Kristensen, 2009).

Thus, there is a clear need for additional research to examine the impact of variation in life stress on physical activity. The population should include both males and females

and utilize an objective measures of physical activity. This study was designed to fill meet this need.

METHODS

Participants

The participants were 98 students (49 males, 49 females) aged 18-23 years from an upper division health education course at a large southwestern university. All participants were volunteers and were recruited by the PI while in their class. Participants were compensated with extra credit for their class upon completion of the study. Participants could only take part in the study if they had a cell phone that received text messages and if they had no disability that prevented them from being physically active.

Procedures

Procedures were explained prior to obtaining written consent. Data collection started on a Thursday. At the start of this week, participants filled out a demographic survey. Each participant was provided an accelerometer and trained in its placement. They were asked to wear the accelerometer on their right hip for all waking hours for one week. They were also asked to complete the Perceived Stress Scale each evening during the data collection week. To facilitate completion of the questionnaire, the Perceived Stress Scale was completed online, using a link that was texted to the participants. They received three reminders each night to fill out the Perceived Stress Scale. Additional text messages were sent each morning to remind the participants to wear their accelerometers. At the end of the data collection week, the accelerometers were returned.

Measures

Independent Variable

Psychological stress was assessed using the Perceived Stress Scale. The Perceived Stress Scale (PSS) is a 10-item scale that asks people to rank items on a 4-point Likert-type scale anchored by "never" to "very often." Examples of items on this scale are "In the past month, how often have you been upset because of something that happened unexpectedly?" The PSS has been shown to be a reliable scale, with Cronbach's coefficient at 0.86 (Cohen et al., 1983).

This study aimed to determine daily fluctuations in psychological stress. As a result, "In the past month" was changed to "Throughout the course of today". Moreover, the analysis was based on comparing physical activity during a high and low stress day. To this end, PSS data were analyzed. A low stress day was determined by selecting the weekday with the lowest PSS score for each participant. The high stress day was determined by selecting a weekday with the highest PSS score for each participant. Thus, the specific day varied by participant over the course of the week. Weekends were excluded since barriers to exercise differ on weekends.

Dependent Variable

ActiGraph GT1M Accelerometers were used to measure physical activity during the week of data collection. The GT1M is a uniaxial accelerometer that detects vertical accelerations. It provides data on intensity, duration, and frequency of the user's physical activity. It can be used to determine how much time the user spends in sedentary, light, moderate, or vigorous activity. Participants were instructed to wear the accelerometer on their right hips every day of the data collection week for all waking hours. This study investigated the amount of time the user spent in moderate-to-vigorous physical activity

(MVPA) as this is consistent in determining if one is classified as physically active. Accelerometers are a validated and reliable measure for physical activity (Abel et al., 2008).

RESULTS

Analysis

Participants

All demographic data are presented in Table 1. Ninety-eight participants completed the study. Those who had more than 2880 minutes of accelerometer non-wear time were excluded from the analysis, since they did not wear their accelerometers for eight hours a day. This resulted in 68 participants. Sixty-four of the sixty-eight participants met the weekly recommendation for physical activity of 150 minutes of MVPA on most days of the week, 33 females and 31 males. Only four participants did not meet the recommendations. A Chi-square test was performed to see if there was a significant difference between those who were included and excluded on all demographic variables. Only race was found to be statistically significant $\chi^2(3, N = 98) = 9.87$, $p = .02$. Post hoc analyses were performed and it was found that there were a significantly higher percentage of African-Americans and whites than expected in those who did not complete the study, $\chi^2(1, N = 98) = 7.2$, $p = .007$ and $\chi^2(1, N = 98) = 6.6$, $p = .01$ respectively. Participants were college aged ($M = 20.2$ $SD = .9$), mostly 73.5% white and 73.5% non-Hispanic with all races represented.

(N = 68)	Overall
Age in years M (SD)	20.2 (.91)
Gender N (%)	
Female	35 (51.5)
Male	33 (48.5)
Ethnicity N (%)	
Hispanic or Latino	18 (26.5)
Not Hispanic or Latino	50 (73.5)
Race N (%)	
African American of Black	6 (8.8)
White	50 (73.5)
Asian	8 (11.8)
Other	4 (5.9)
BMI Category N (%)	
Underweight (Below 18.5)	6 (8.8)
Normal or Healthy Weight (18.5-24.9)	42 (61.8)
Overweight (25.0-29.9)	13 (19.1)
Obese (30.0 and Above)	7 (10.3)

Table 1. Demographic variables for 68 participants. Demographic variables included are age, gender, ethnicity, race, and BMI category. Both number and percentages are reported.

Activity

Participants had an average wear time of 4385.6 minutes (*SD* = 724.3) and average time in MVPA of 315.6 minutes (*SD* = 106.5). The average number of minutes spent in MVPA on the low stress day and high stress day were 50.5 minutes (*SD* = 27.2) and 66.3 minutes (*SD* = 34.5) respectively.

Perceived Stress

The average PSS score for the week was 14.7 (SD = 6.1). The average PSS differed significantly, $t(67) = -15.2$, $p < .01$, for the low stress ($M = 9.2$, $SD = 6.3$) and high stress ($M = 21.6$, $SD = 8.3$) day.

Primary Outcome

To test differences in MVPA, we conducted a 2 (gender) x 2 (stress day) ANOVA with repeated measures on the last factor. Results are presented in Table 2. There was a significant main effect for stress day, $F(1, 66) = 10.82$, $p = .002$. There was a significant interaction between stress day and sex, $F(1, 66) = 7.55$, $p = .008$. To explore this interaction, differences in MVPA were assessed using an independent sample t-test across days within each level of sex. This revealed a significant difference for women, $t(34) = -3.8$, $p = .001$), but not for men $t(32) = -.47$, $p = .64$. Specifically, for women the average number of minutes of MVPA for the low stress day and high stress day were 42.9 minutes ($SD = 26.7$) and 71.3 minutes ($SD = 39.3$) respectively. For men the average number of minutes of MVPA for the low stress day and high stress day were 58.6 minutes ($SD = 25.8$) and 61.1 minutes ($SD = 28.2$) respectively. These results are presented in Figure 1.

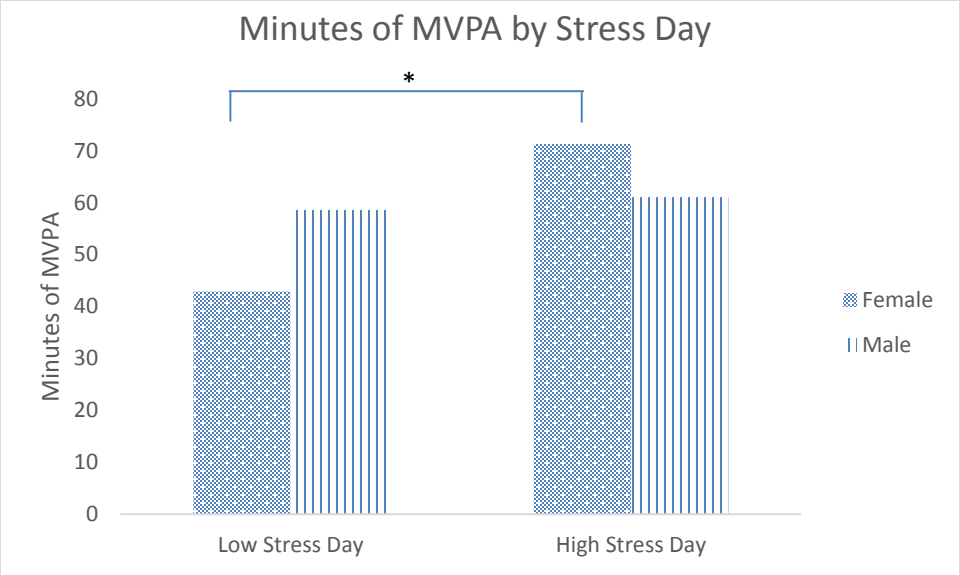

Figure 1. Minutes of MVPA for females (dots) and males (stripes) for the group's low stress and high stress day. The interaction was significant such that females significantly increased their minutes of MVPA on their high stress day compared to their low stress day.

Effect	*MS*	*df*	*F*	*p*
Stress Day	8134.5	66	10.8	.002
Stress Day x Gender	5675.2	66	7.5	.008

Table 2. A 2 (Gender) x 2 (Stress Day) Repeated Measures Analysis of Variance with Gender as the between subjects factor results.

DISCUSSION

The purpose of this study was to investigate how gender moderates the relationship between stress and physical. That is, do males and females change their physical activity behavior in response to stress differently? To test this question, physical activity and stress data were collected daily over the course of a week from 68 undergraduate students. Using their daily stress scores, their levels of MVPA from their lowest stress day and highest stress day were analyzed to detect any significant differences. Results indicated that females who were regular exercisers responded to stress by increasing their levels of

physical activity while males maintained the same levels of physical activity. This distinction between genders is important as it sheds light on potential differences in coping mechanisms between males and female regular exercisers. By understanding this difference, different stress interventions can optimize their effects by taking into account gender and exercise behavior.

This finding is consistent with the previous research done by Lutz and colleagues (2010). In this cross-sectional study, females who were regular exercisers increased their levels of physical activity when they experienced higher levels of perceived stress. In contrast, females who were not regular exercisers responded to stress by decreasing their levels of physical activity. This trend was also seen in a study done by (Siegel, Broman, & Hetta, 2002) who found that females who were habitual exercisers increased their physical activity when stressed while those who were not decreased their physical activity.

This pattern of effect is of interest because it suggests that females who are regular exercisers may use exercise as a way to cope with stress. The present study differs from the previously mentioned studied because it used an objective measure of physical activity. As stated before, self-reported measures of physical activity are especially problematic due to issues with recall and different biases that lead to overestimation and underestimation of physical activity. By using an objective measure, these issues do not exist. Another difference is that this study included males. After seeing a pattern with how females change their physical activity in respond to stress, it is important to investigate if there is a pattern in males. This study showed that there was no change in males' physical activity, suggesting males may cope differently or may not feel the need to cope. However, the present study did not measure coping mechanisms, therefore more research needs to be done to make this conclusion.

There are a number of limitations to this study. The sample was limited to regular exercisers. As seen in previous studies, females who were not regular exercisers decreased their levels of physical activity when stressed. It is important to replicate these findings by using an objective measure of physical activity. Furthermore, there is a need to investigate how males who are not regular exercisers respond to stress. However, by only including those who were regular exercisers there was more power in detecting if stress is related to an increase in physical activity. This pattern is not expected in a sedentary or inactive female population. Furthermore, not much is known about males who are not regular exercisers. Both require further investigation. Another limitation is there was only a one week window to assess variation in stress. As such, the low stress day and high stress day may not reflect a general criteria for these labels. That is an individual may not have had their most and least stressful day during the week we observed. This is problematic in that we do not know how their behavior would have changed had they experienced a stress free or highly stressed day. Despite this, this study did find significant differences between high and low stress days. For females, the low stress day scores ranged from 0 to 27, and the high stress day scores ranged from 12 to 38. Despite the overlap, 60% of scores from the low stress day were below 12, the low score from the high stress day and about 30% of scores from the high stress day were above the highest score for the low stress day. For males, the low stress day scores ranged from 0 to 20 and the high stress day scores ranged from 0 to 32. The two days had the same low score although only 1 subject reported a 0 for their stress score from the high stress day and 4 reported 0 for their low stress day. About 40% of the scores from the high stress day were above the highest score from the low stress day. Despite the overlaps, there was a difference in stress scores between the two days and this differences resulted in a difference in physical activity behavior for females. This at the very least shows what the middle range of a dose-response relationship

would emulate. More research should be done over a longer time period to allow for larger, natural variations in stress and resultant behavior in order to develop a true dose-response curve. Finally, the sample was limited to college aged students. These individuals have easy access to exercise facilities compared to the general public. This provides them with the means of being physically active if they choose with minimal interference. The general public faces many barriers to engaging in physical activity such as cost and distance. Future research is needed to investigate different settings where participants do not have such easy access to be physically active.

Despite these limitations, this was the first study to use an objective measure of physical activity to investigate changes in physical activity due to psychological stress. Additionally, males were included. This allowed the replication of the findings of Lutz and colleagues (2010) and Siegel and colleagues (2002) and extends them to show males who were regular exercisers had no change in physical activity and by using a more reliable measure of physical activity. These findings suggest that how an individual responds to stress is gender dependent. Although this study was not able to measure it, exercise behavior may play a key role in this relationship as well. Future research should include gender and exercise behavior as moderators when investigating how stress affects physical activity behavior. Lastly, any interventions targeting physical activity outcomes to stress should consider these differences in gender and exercise behavior.

Appendix A

IRB APPLICATION SUMMARY

General Study Information	
Title:	Measuring How Stress Impacts the Physical Activity and Dietary Behaviors of Undergraduate Students
Alternate Title:	
Study Number:	2014-03-0061
Principal Investigator Name and UT EID:	Katelyn Born kb33784
Principal Investigator Department:	Kinesiology and Health Education
PI Position and Training Status:	STUDENT Training Record Exists
PI EMail address and Phone Number:	KATELYNBORN@UTEXAS.EDU
Type of Approval (& category, if applicable):	EXPEDITED
Approval Start Date and End Date:	07-30-2015 07-29-2016
Date PI Approved	04:52PM 04/07/2014
Date Submitted	**05/16/14**
Status	APPROVED
Study Type (& description if applicable):	MASTER THESIS
Prior IRB (institution(s) other than UT):	

Key Personnel and Other Pertinent Involved Parties	
Co-Investigator (Key Personnel) Information	
Name and UT EID:	John Bartholomew jbart
Training Status and Approval Time:	Training Record Exists 05:22AM 03/18/2014
DRC Name and UT EID:	Robert Matthew Brothers rb29867
Training Status:	Training Record Exists
DRC Approval Time:	11:38AM 07/17/2015
Faculty Sponsor Name and UT EID:	John Bartholomew jbart
Training Status:	Training Record Exists
Faculty Sponsor Approval Time:	08:47AM 07/08/2015
Other Names and UT EIDs:	Jenny Ann Eskew; je22892

Conflict of Interest Items	
Current or future PATENT or LICENSE:	
Sponsor/Private Company Influence:	
Key Personnel Conflict of Interest:	
Other Conflict of Interest:	

Subject Details	
Included Subject Type(s)	UT STUDENT

Supervision of Student Subjects:	researcher IS NOT instructor or advisor
Supervision of Staff Subjects:	
Subject Gender:	Both
Gender Details:	
Subject Ethnicity:	
Ethnicity Details:	
Number of Subjects in Study:	50
Recruitment Plan:	Students will be recruited through an undergraduate course that has 150 students enrolled.
Time required of subject:	170 MINUTE
Subject Minimum and Maximum Age	18 30
Rationale for Minor Subjects:	
Description - Rationale for Minor Subjects:	
Student Subjects Class Credit Status:	Students will receive class credit or bonus points for participation
Student Subjects Alternate Credit Status:	Alternatives for credit have been explained
Subject Data Collected	Name
HIPAA PHI (Personal Health Information) Collection?	N
HIPAA Access to Subject PHI?	N

Study Details

Rationale for Risk:	
Use of Audio Recording:	Y
Use of Video Recording:	N
Use of Controlled Substances:	N
DEA Number and Expiration (if applicable):	
Disease Direct Benefit:	
Disease Treatment:	
Additional Treatment and Cost:	
Specific Medications:	
Location:	UT Austin
Location Description:	Kinesiology and Health Education Departnemnt, Bellmont Hall, Exercise and Sport Psychology Laboratory.
Unanticipated Problems Monitor:	N
Unanticipated Problems Description:	
Use of Radiation or Radioactive Materials:	N
Use of Human Tissue/body Fluids:	N
Use of Genetic Testing:	N
IBC Approval Number (if applicable):	

Subjects with childbearing potential:	N
Use of Pregnancy Test and Details for Test Payment:	
Facilities Description:	
Staff Description:	
Time Description:	
Multi-Site Management Description:	
Ancillary Resource Description:	Students who may need help will be given resources to seek counseling services at UT on their own accord.
Training Description:	They will read the study protocol and as the PI any questions they have.

Consent Details

Waiver of Consent:	
Waiver Rationale:	
Plainly Written Consent Form:	Y
Consent Form Additional Languages:	N
Subject Copy of Consent Form:	Y
Consent Form Waiver of Responsibility:	N
Consent Obtainer:	Principal Investigator

Consent Obtainer Description:	
Consent Provider:	Study subject/participant
Consent Provider Description:	

Funding and Financial Information	
OSP (Office of Sponsored Projects) Number:	
Study Funded?:	Y
Type of Funding:	UT Department, College, or other UT Affiliation
Fund Type Description:	Exercise and Sport Psychology Laboratory
Treatment Cost:	
Subject Reimbursement for Expenses:	0.00
Subject Compensation:	Y
Compensation/Prorate Description:	Extra credit will be given to those who shoose to participate for the class they are recruited from.
Referral Money:	

Miscellaneous	
Additional Documentation:	Additional Documentation
Creator UT EID and Create Time	kb33784, 2:37PM 03/17/2014

IRB History

IRB History for study 2014030061

Action Requested	Request Date	IRB Action Taken	Taken Date	Details
New Study	05/16/2014	Approve	07/08/2014	
Cessation	07/08/2015	Approve	07/08/2015	
Cont Review	07/17/2015	Approve	07/30/2015	

Appendix B

RESEARCH PROPOSAL

Title

"Measuring how Stress Impacts the Physical Activity and Dietary Behaviors of Undergraduate Students"

Principal Investigator

Katelyn Born, (PI), kb33784; John B Batholomew, Ph.D., (Faculty Sponsor), jbart

Purpose

People often report over-eating during periods of stress. For example, the Psychosomatic Theory describes a particular phenomenon called emotional eating - where emotional eaters will excessively eat under negative arousal states (van Strien et al., 2007). Emotional eaters have been shown to choose less healthy food options when perceiving high levels of stress compared to normal eaters (Oliver, Wardle & Gibson, 2000). It was originally thought that only emotional eaters would respond to stress with increased caloric in-take. However, both restrained eaters, who habitually restrict caloric in-take (Zellner et al., 2005) and normal eaters (Macht, 2007) increased their caloric intake and ate a greater amount of high-calorie food when they were stressed. This has clear implications for those who are repeatedly stressed as a high level of caloric in-take is associated with obesity (Behzad, King, & Jocabson, 2013).

The increase in caloric intake is only problematic if it is not met with a similar increase in caloric expenditure. That is, obesity derives from an imbalance in caloric intake relative to caloric expenditures (Koplan & Dietz, 1999). If stressed individuals eat more but also increase physical activity then one would expect less change in body weight. There

is some reason to expect that physical activity will increase during periods of stress. While more research has focused on the impact of exercise on the experience of stress (Buckley et al., 2004), more recent research has investigated the bidirectionality of the stress and physical activity relationship, with a specific interest in the impact of stress on the engagement of physical activity. While these studies tend to show that the experience of stress is inversely related to physical activity in most participants, it also indicates that habitual exercisers increase their pursuit of physical activity – potentially as a coping mechanism (Stults-Kolehmainen & Sinha, 2013).

To date, there is no research that has examined the impact of stress on both dietary behavior and physical activity. As a result, it is difficult to examine the impact of stress on behavior related to obesity. This study is designed to fill this void. It will utilize a convenience sample of undergraduate students and will track their daily reports of perceived stress over the course of one week. It will also assess daily reports of physical activity and dietary behaviors. The resulting data will allow for a synergistic assessment of stress and its impact on both diet and physical activity. In addition, we will utilize measures of restrained and emotional eating as potential moderators. We hypothesize that stress will 1) cause restricted and normal eaters to increase their caloric intake and amount of high-calorie food in restricted eaters and normal eaters, 2) cause emotional eaters to eat more unhealthy food choices, 3) decrease physical activity in non-habitual exercisers, and 4) increase physical activity in habitual exercisers.

Procedures

Overview: This study will measure perceived stress, physical activity, and diet. Participants will be recruited from one undergraduate health promotion class at the University of Texas at Austin (HED 329K: Child, Adolescent and Adult Health); 50 volunteers will be asked to take part in this study during their regularly scheduled class

time. If more than 50 students want to take part in the study, two waves of data collection will take place in the Fall 2014 semester, each wave will have at maximum 50 participants. Volunteers may only participate once they have signed a consent form. They will consent to completing two questionnaires, wearing an accelerometer for one week, filling out a daily survey, and a 20 min interview that will be audio recorded. Once consented, they will be provided a unique identifying number. In an effort to assess participants during a time with academic stress, we will target a week for data collection when there are at least two major assignments (paper longer than 5 pages; exam; etc.) due. The data collection week for all participants will be picked once participants have submitted a schedule with due dates of assignments, projects, and exams. The PI will select a date using these schedules

Baseline assessments: Baseline assessments will take 45 minutes to complete and will be completed in the Exercise and Sport Psychology Laboratory under supervision in order for any questions to be answered by the PI. Before they take part in the study, each participant will be asked to complete the Revised Restraint Scale and an Emotional Eating Scale to determine the extent of their restrained and emotional eating respectively. In addition, they will be asked to also complete a Behavioral Regulation in Exercise Questionnaire that assesses their motivation for exercise. Each assessment tool will take 10-15 minutes to complete and all will be given at one time. Participants will then be asked to provide a schedule of upcoming due dates for assignments.

Testing Week: The Testing Week will be a week in duration. Each student will be given an accelerometer corresponding with their identification number 4 days prior to a major assignment due date and asked to wear it for one week. Instructions on how and when to wear them will be given to them orally as well as visually per demonstration. Students will be asked to fill out the Perceived Stress scale each night, along with measures

of physical activity and diet for that day. This should take approximately 15 minutes to complete. Reminders will be sent via text message. Each participant will be informed that texting rates apply. Participants will receive additional text messages (up to three) until a response has been received. Participants will either email their responses to the PI or text the PI their responses.

Interviews: After Testing Week, all responses to the daily survey regarding physical activity and diet will be reviewed. In order to verify responses, interviews will be conducted with 50% of the students. These interviews are merely a check for accuracy of responses, there are not meant as to serve as qualitative research. For example, if a participant writes that they performed aerobic exercise, the PI would ask what type of aerobic activity. The interviews will be 20 minutes and will be audio recorded for quality assurance.

Location

Students will be recruited in their classroom in Bellmont Hall at the University of Texas at Austin during class time. Any interaction between the investigator and the students in person will be in Bellmont Hall. The remainder of the study will occur in the students' natural locations throughout the week. Texts and emails will be used as reminders or notifications otherwise. All data analysis will be done in the Exercise & Sport Psychology Laboratory in Bellmont Hall.

Resources

The Exercise & Sport Psychology Lab at the University of Texas will be used for all data entry and analysis. The lab contains four computers, printers, and workspace. One Master's student will be dedicated to handing out consent forms, any other forms used, ensuring confidentiality, and data collections. A locked file cabinet is available to store

data for this project, only to PI and the faculty sponsor will have access to the keys to this cabinet.

Study Timeline

Students will begin being recruited at the start of the Fall 2014 semester. Data collections will occur for a week interval within the fall semesters during a target week when there are at least two major assignments (paper longer than 5 pages; exam; etc.) due. Write ups will be done throughout, with the final write up will be done by April 2015. The results will be disseminated by April 2015.

5. Measures

a. ActiGraph GT1M Accelerometers

Accelerometers will be used to measure physical activity of students during the week of data collection. They use a uniaxial accelerometer that detects vertical accelerations. It provides data on intensity, duration, frequency, and a step count for the user's physical activity. Population-specific equations can be used to determine energy expenditure for specific bouts of activity or for overall time worn. It can also be used to determine how much time the user spends in sedentary, light, moderate, or vigorous activity. Accelerometers are a validated and reliable measure for physical activity (Abel et al., 2008).

b. Behavioral Regulation in Exercise Questionnaire (BREQ)

The Behavioral Regulation in Exercise Questionnaire (BREQ) was developed by Mullan, Markland and Ingledew in 1997. It is a 15 item questionnaire that asks respondents to rank answers to the question "Why do you engage in exercise?" It uses a 5-point likert scale anchored by "Not true for me" and "Very true for me." There are 4 subscales to the BREQ: external regulation (e.g. I exercise because other people say I should), introjected regulation (e.g. I feel guilty when I don't exercise), identified

regulation (e.g. I value the benefits of exercise), and intrinsic regulation (e.g. I exercise because it's fun.) The values for each subscale are summed and then weighted. In addition, all the subscales are combined to give a single value called the Relative Autonomy Index. This is used to show the degree to which respondents feel self-determined in their motives. The Cronbach's coefficients for external regulation, introjected regulation, identified regulation, and intrinsic regulation are 0.79, 0.76, 0.77, and 0.90 respectively (Mullan et al., 1997)

c. Revised Restraint Scale (RRS)

The Revised Restraint Scale is a 10-item questionnaire that is used to identify restrained eaters developed by Herman and Polivy. Items are used to indicate to two subscales: weight fluctuation (WF) (e.g. In a typical week, how much does your weight fluctuate?); and concern over dieting (CD), (e.g. Do you have feelings of guilt after overeating?) The Cronbach's coefficient for the WF and CD subscales were found to be 0.77 and 0.76 respectively (Mak & Lai, 2011).

d. Emotional Eating Scale

The Emotional Eating Scale was developed by Arnow, Kenardy, and Agras (1995). It is a 25-item questionnaire that uses a 5-point likert scale labeled with "no desire to eat" to "an overwhelming desire to eat." There are three subscales related to the emotions that provoke excessive eating: anger, anxiety, and depression. For example, the questionnaire will provide the word "Resentful" and the respondent will choose from the following: "No Desire to Eat," "A Small Desire to Eat," A Moderate Desire to Eat," "A Strong Urge to Eat," and "An overwhelming Urge to Eat." The Cronbach's coefficient for the anger/frustration, anxiety, and depression are 0.78, 0.78, and 0.72 respectively (Arnow et al., 1995).

e. Perceived Stress Scale.

The Perceived Stress Scale is a 10-item scale that asks people to rank items on a 4 point Likert scale anchored by "never" "very often." Each item is designed to reveal the degree to which respondents feel their lives are unpredictable, they are meant to show whether or not they feel certain situations exceed their ability to cope with them. Examples of items on this scale are "Since your last survey, how often have you been upset because of something that happened unexpectedly?" The Cronbach's coefficient for the PSS is 0.86 (Cohen et al., 1983).

f. Daily Survey

The Daily Survey will be a measure made specifically for this study. It will contain 7 questions that ask about the types of physical activity they participated in throughout the day as well as diet choices they made. The survey will ask the participant to rank certain items. Some of questions to be used for the nutrition and physical activity questions will be "On a scale of 1-10, 1 meaning the worst diet and 10 being the best diet, how would you rate your meal choices today?" and "On a scale of 1-10, 1 meaning very dissatisfied and 10 meaning very satisfied, how would you rate your physical activity for the day?"

f. Interviews

Once the data collection has ended, students' daily surveys will be evaluated and interviews will be conducted to review and verify responses. This is solely an attempt to ensure accuracy of responses, not as a component of qualitative research. Sample questions include "What type of weight training did you do?" and " What did you eat this day where you did not feel that your diet was healthy?"

Participants

a. Target Population

The target population will be undergraduate students from HED 329K: Child, Adolescent, and Adult Health. The sample size will be n=100 participants.

b. Inclusion/Exclusion

Undergraduate students who are enrolled in HED 329K: Child, Adolescent, and Adult Health will be allowed to take part in this study. Students must be between the ages of 18-30 and have a cell phone that receives text messages. They must also report regular exercise (at least 3 times per week).

c. Benefits

There are no specific benefits that will accrue from this study. Participants will be able to receive extra credit. This is but one opportunity for extra credit. Other options include a 20 slide PowerPoint presentation complete with slide notes on a topic of interest not covered within the content of HED 329K: Child, Adolescent, and Adult Health.

d. Risks

Because this is based on their existing level of physical activity, there are no physical risks beyond their normal activity. There may be emotional reactance to some of the questions about eating behaviors or stress. If someone presents with high emotional (26 or higher for anger/frustration, 16 or higher for anxiety, 12 or higher for depression) and/or restrained eating score (15 or higher) they are at risk for having an eating disorder and will be given resources for them to seek help if they choose at University of Texas' counseling center. If a participant presents with high stress they will also be given resources to contact the counseling center.

e. Recruitment

Participants will be recruited by the PI from the HED 329K: Child, Adolescent, & Adult Health class and asking them to take part in the study after gaining

preapproval from the professor of that class. The professor of HED 329K: Child, Adolescent, & Adult Health has also provided a recruitment letter that he will send to his class at the beginning of this study. This announcement will be posted to Canvas for the class and will also be given orally by Dr. Peterson.

f. Obtaining Informed Consent

All participants will be told by the PI the extent of the study as well as what is expected of them if they choose to participate. They will then be given a consent form that will be read to them as they read along. If they agree, there is a separate signature sheet that they will turn in, allowing them to keep a copy of the consent form.

Privacy and Confidentiality

Each participant will be assigned a unique identification number to protect the privacy of participants. All correspondence will be done using ID numbers. This number will be utilized for all data. A master list of participants and their identification numbers will be kept in a secure locked file cabinet, separate from any data. As the data is collected, it will be reviewed for any identifying information (i.e. name or phone number). These will be replaced with the unique ID number and the identifying information will be removed. Identifiable data will be destroyed after data collection and analysis. Signed consent forms will be retained for three years after the study is closed. Text messages will be deleted once the data has been recorded, at most one week after they have been received. Audio recordings will be destroyed after the Spring 2015 semester.

Compensation

Participants will be compensated with extra credit for the course from which they were recruited. In order for there to not be pressure to participate just for credit, an alternate assignment of a 20 slide PowerPoint presentation complete with slide notes pertaining to a topic of interest that was not covered in the material for HED 329K: Child, Adolescent,

and Adult Health will be provided by the professor that will equate in the points that would have been obtained from taking part in the study. Anyone who does not complete or want to take part in the study and still want extra credit will be allowed to use this option.

Appendix C

CONSENT FORM

Consent for Participation in Research

Title: Measuring How Stress Impacts the Physical Activity and Dietary Behaviors of Undergraduate Students

Introduction

The purpose of this form is to provide you information that may affect your decision as to whether or not to participate in this research study. The person performing the research will answer any of your questions. Read the information below and ask any questions you might have before deciding whether or not to take part. If you decide to be involved in this study, this form will be used to record your consent.

Purpose of the Study

You have been asked to participate in a research study about the effects stress has on physical activity and nutrition. The purpose of this study is to determine the relationship amongst, stress physical activity, and diet.

What will you to be asked to do?

The study will include approximately 50 study participants.

Your participation may be audio recorded during the interview portion.

If you agree to participate in this study, you will be asked to:

Complete a 45 minute questionnaire about food choices and motivation to exercise

Complete a Revised Restraint Scale before taking part in the study

The RRS is a short, 10-item questionnaire that will ask about behaviors revolving around food choices.

Complete an Emotional Eating Scale before taking part in the study

The EES is a 25-item questionnaire that asks about food choices made while feeling certain emotions.

Complete a Behavioral Regulation in Exercise Questionnaire before taking part in the study

This questionnaire will ask questions regarding various aspects of motivation to exercise.

Provide a schedule of upcoming dates that may increase your levels of stress, for example exam dates and school assignments.

During a predetermined week, you will be asked to wear an accelerometer around your waist that is about the size of a belt with a small pouch attached to it.

For the week you are wearing the accelerometer, you will complete a 10 minute survey about diet, exercise, and stress that you will submit to the investigator via text message.

One week later, you will complete a 20 minute audio taped interview to share your thoughts about the study and clarify any of your responses

This study will take place over 9 days: 1 for pre-testing; 1 for the follow-up interview, and 7 for the actual study. This study will include approximately 100 study participantsDuring the pre-test, it should take 45 minutes for the questionnaires. During the week of data collection it should take less than 10 min/day. The follow-up interview will take 20 minutes.

What are the risks involved in this study?

The study will not ask you to change your behavior. As a result, there are no foreseeable risks beyond your present activities when participating in this study. Some of the questions may make you feel uncomfortable.

What are the possible benefits of this study?

You will receive no direct benefit from participating in this study. This will be one of a number of options to obtain extra credit points for class.

Do you have to participate?

No, your participation is voluntary. You may decide not to participate at all or, if you start the study, you may withdraw at any time. Withdrawal or refusing to participate will not affect your relationship with The University of Texas at Austin in anyway.

If you would like to participate, you will receive a copy of this form via the PI after a copy has been made for the researcher's records.

Will there be any compensation?

You will receive extra credit for your class for participating in this research. Extra credit will be given at the professor's discretion in regards to how the credit will affect your grade, if it will be given on a test or towards the overall points for the course. If you choose not to take part in the study but still wish to receive extra credit, you may complete an alternate assignment of making a PowerPoint presentation complete with slide notes on a topic that is not covered in HED 329K: Child, Adolescent, and Adult Health that you are interested in. This will be worth up to the same amount of extra credit as participating in the study.

How will your privacy and confidentiality be protected if you participate in this research study?

Your privacy and the confidentiality of your data will be protected by the researchers assigning identification numbers to all study participants. Participants will only be referred to be their identification number. All records will be kept inside of a locked drawer within the researcher's lab and all identifying criteria will be destroyed after data collection and analysis. Text messgaes will be deleted once the data is recorded, which may take up to one week after they have been received.

If it becomes necessary for the Institutional Review Board to review the study records, information that can be linked to you will be protected to the extent permitted by law. Your research records will not be released without your consent unless required by law or a court order. The data resulting from your participation may be made available to other researchers in the future for

research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate it with you, or with your participation in any study.

If you choose to participate in this study, you may choose to be audio recorded. Any audio recordings will be stored securely and only the research team will have access to the recordings. Recordings will be kept for 1 school year and then erased.

Whom to contact with questions about the study?

Prior, during or after your participation you can contact the researcher Katelyn Born at (925) 822-7977 or send an email to katelynborn@utexas.edu for any questions or if you feel that you have been harmed. You may also contact her faculty advisor, Professor John Bartholomew (512) 232-6021; jbart@austin.utexas.edu

Whom to contact with questions concerning your rights as a research participant?

For questions about your rights or any dissatisfaction with any part of this study, you can contact, anonymously if you wish, the Institutional Review Board by phone at (512) 471-8871 or email at orsc@uts.cc.utexas.edu.

Participation

If you agree to participate I will collect the signature sheet after class.

If you agree to participate, you are free to end participation at anytime.

Signature

You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time. You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights.

_____ I agree to be audio recorded.

_____ I do not want to be audio recorded.

_____

Printed Name

_____ _____

Signature Date

_____

e-mail

_____

cell number

As a representative of this study, I have explained the purpose, procedures, benefits, and the risks involved in this research study.

_____

Print Name of Person obtaining consent

_____ _____

Signature of Person obtaining consent Date

Appendix D

DEMOGRAPHIC SURVEY

Name: _____

Ethnicity (Choose one):

___ Hispanic or Latino

___ Not Hispanic or Latino

Race (Choose one):

___ White

___ Black of African American

___ Asian

___ American Indian or Alaska Native

___ Native Hawaiian or Pacific Islander

___ Multiracial (2 or more)

Gender

___ Male

___Female

Weight (lbs.): _____ Height (in.): _____

Appendix E

PARTICIPANT INFORMATION SHEET

Unique Identifier:_____

Age: _____ Class (i.e. Freshman): _____

Height:_____ Weight:_____

Exam and School Assignment dates:

Appendix F

PERCEIVED STRESS SCALE

10 items: The questions in this scale ask you about your feelings and thoughts during the day. In each case, please indicate by choosing a number corresponding with how often you felt or thought a certain way.

0 = never 1=almost never 2=sometimes 3=fairly often 4=very often

1. Throughout the course of today, how often have you been upset because of something that happened unexpectedly?
2. Throughout the course of today, how often have you felt that you were unable to control the important things in your life?
3. Throughout the course of today, how often have you felt nervous and "stressed"?
4. Throughout the course of today, how often have you felt confident about your ability to handle your personal problems?
5. Throughout the course of today, how often have you felt things were going your way?
6. Throughout the course of today, how often have you found that you could not cope with all the things you had to do?
7. Throughout the course of today, how often have you been able to control irritations in your life?
8. Throughout the course of today, how often have you felt you were on top of things?
9. Throughout the course of today, how often have you been angered because of things that were outside of your control?
10. Throughout the course of today, how often have you felt difficulties were piling up so high that you could not overcome them?

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